1313299 COMPLETE SPECIFICATION
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Sheet 1

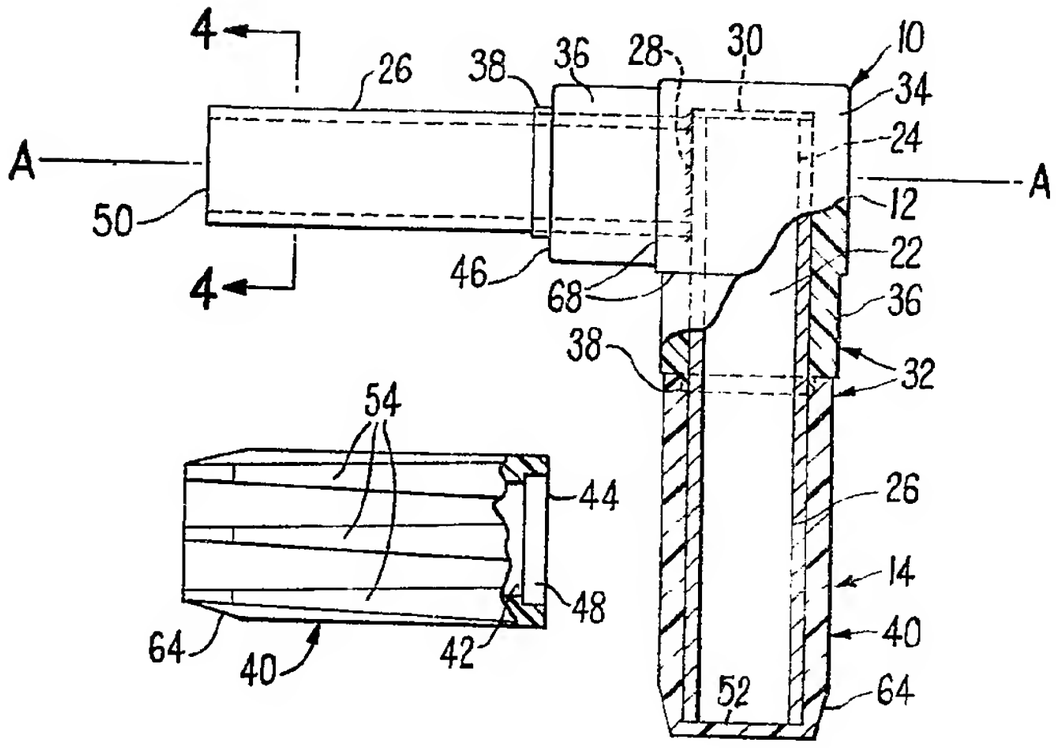


FIG.1

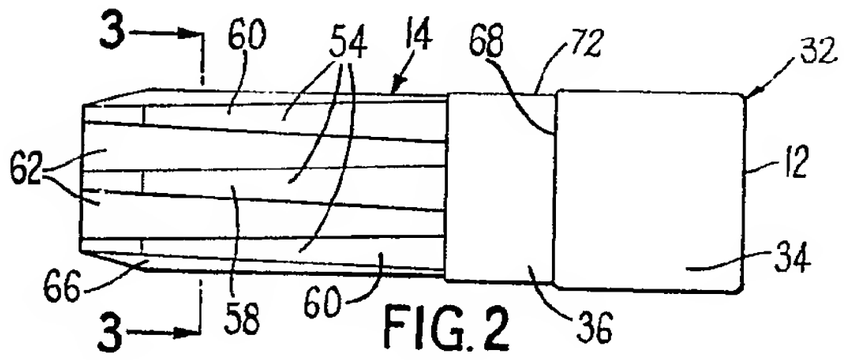


FIG.2

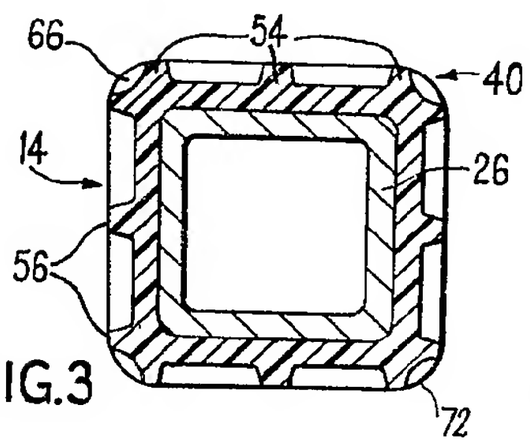


FIG.3

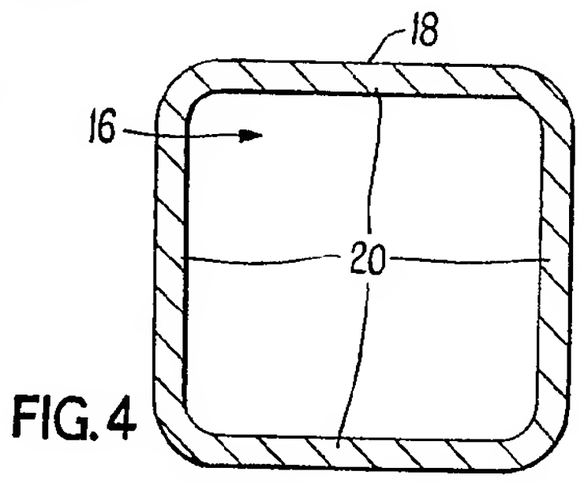


FIG.4

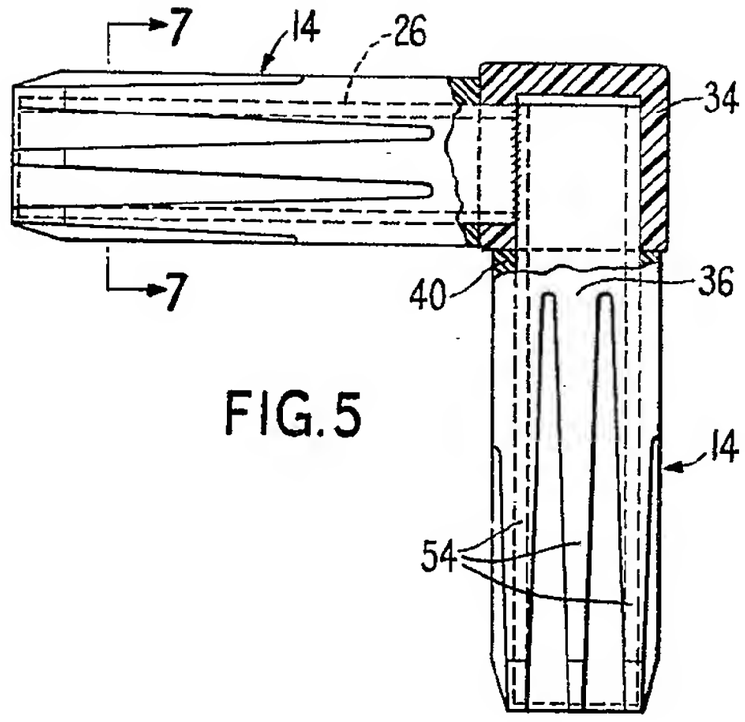


FIG.5

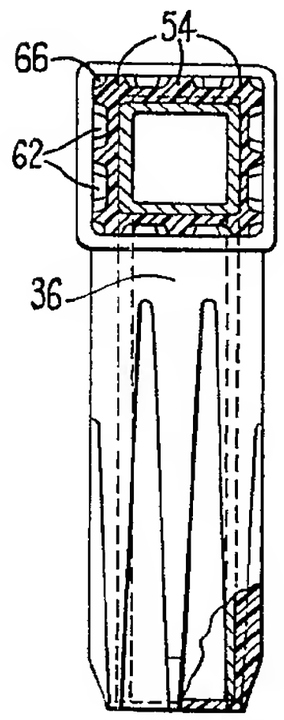


FIG.7

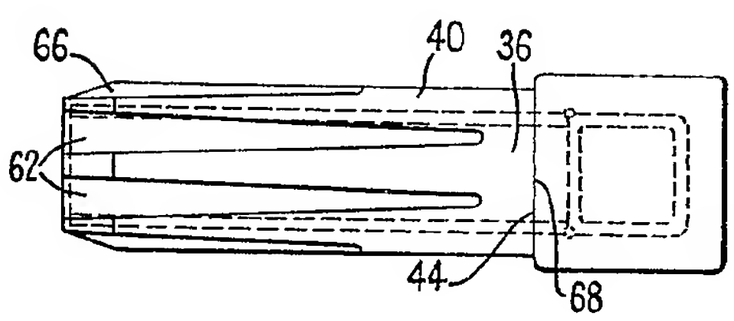


FIG.6

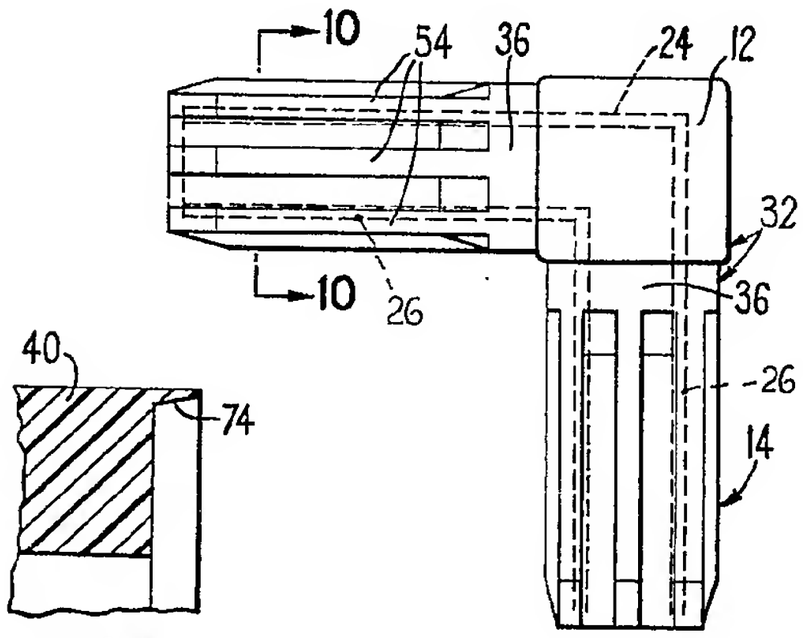


FIG.9

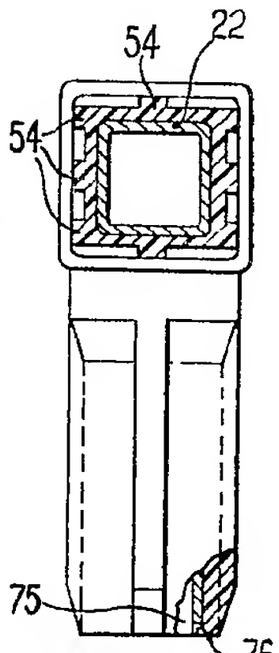


FIG.10




FIG.8

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Sheet 3

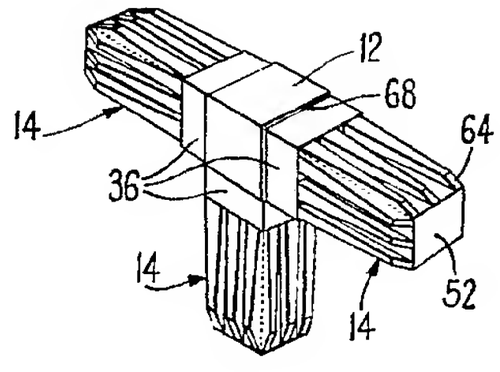


FIG.11

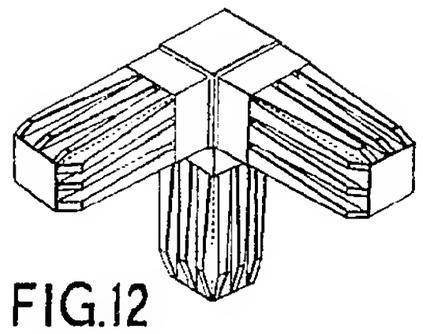

FIG.12

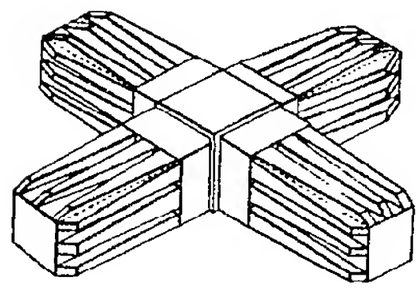

FIG.13

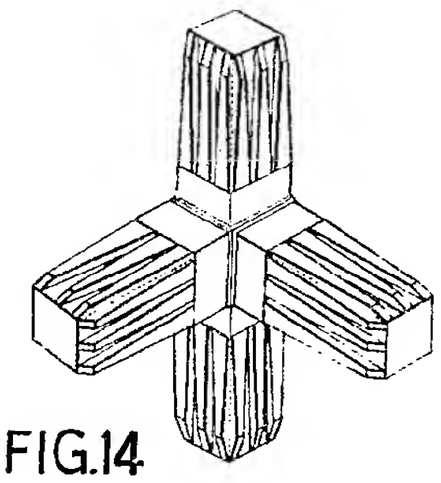

FIG.14

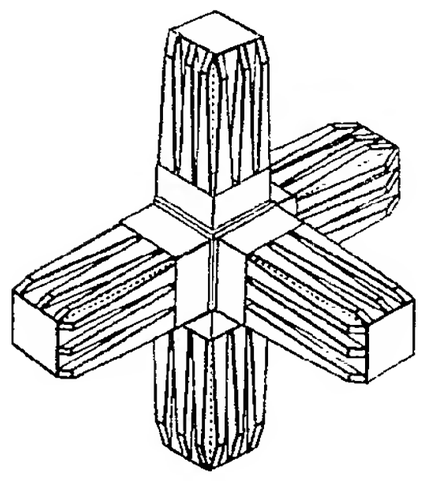

FIG.15

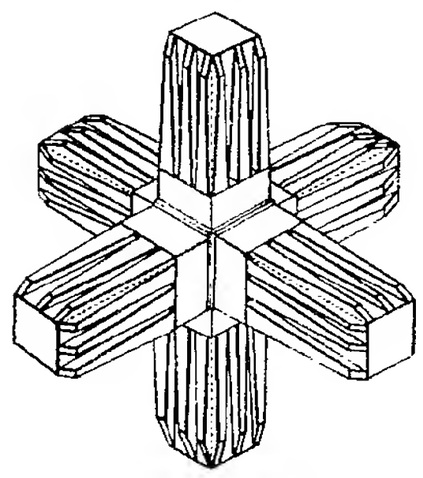

FIG.16

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Sheet 4

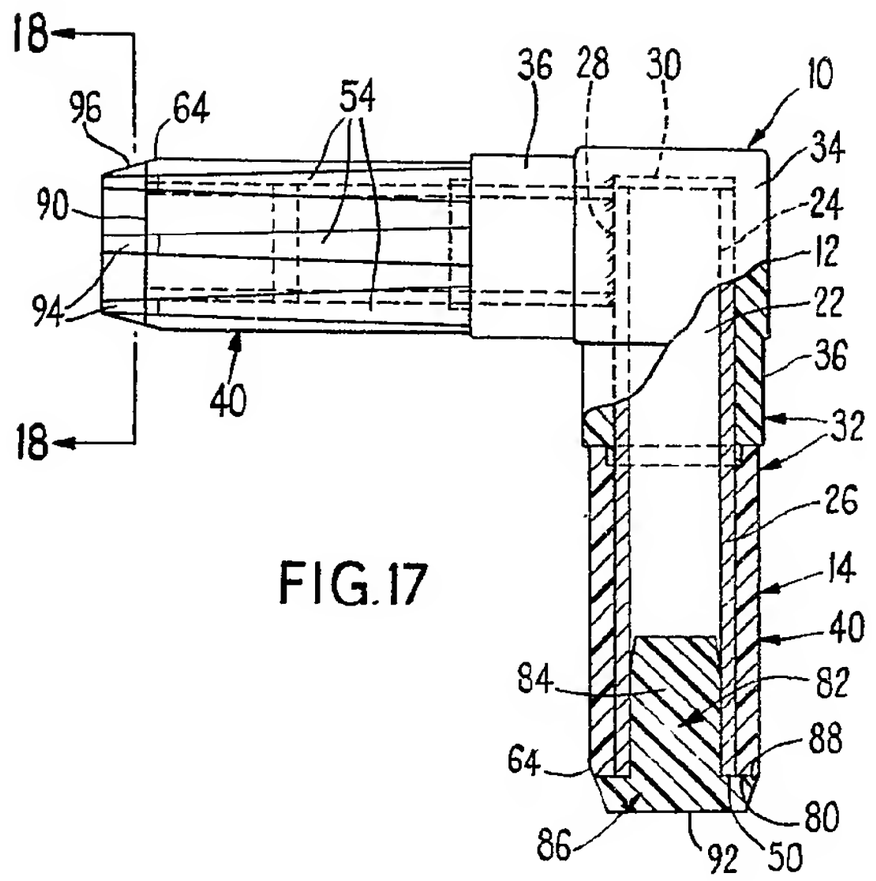


FIG.17

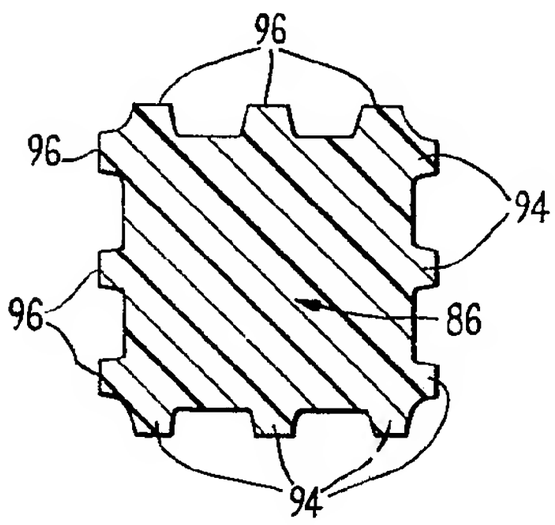


FIG.18

1 313 299

# PATENT SPECIFICATION

(11) 1 313 299

DRAWINGS ATTACHED

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58460/69 29 Nov. 1969

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F2G 24A1 R

(72) Inventors HAROLD JONES and PETER KINNEAR

## (54) IMPROVEMENTS RELATING TO SPIGOT DEVICES TO ENGAGE SOCKETS OF FRAMEWORK MEMBERS

(71) We, LINK 51 LIMITED, a British Company of Imperial House, Bournville Lane, Birmingham, 30, in the County of Warwick, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to spigot devices for engaging sockets of framework members whereby rigid frameworks to suit different requirements can be assembled and disassembled.

It is an object of the present invention to provide an improved spigot device which is relatively easy to manufacture and facilitates quick and easy assembly of rigid frameworks.

According to one aspect of the present invention a spigot device to engage a socket of a framework member comprises a body, a spigot extending therefrom and rigid therewith, the body being of larger overall external cross-sectional dimensions than the spigot to afford a shoulder therebetween against which can abut an end of a socket of the framework member when mounted on the spigot and the spigot having a plurality of external ribs extending longitudinally thereof for the major part of the length of the spigot to afford bearing surfaces to engage the socket and said spigot also having adjacent the shoulder an inner bearing portion which is plain and affords a continuous circumferentially extending bearing surface which is level with or slightly proud of the bearing surface of the ribs.

According to a further aspect of the present invention a spigot device to engage a plurality of sockets of framework members comprises a body and a plurality of spigots extending therefrom and rigid therewith, the body being of larger overall external cross-sectional dimensions than the spigots to afford shoulders between the body and the respective spigots against which can abut ends of sockets of the framework members when mounted on the spigots and each spigot having a plurality of external ribs extending longitudinally thereof for the major part of the length of the spigot to afford bearing surfaces to engage the appropriate socket and each spigot also having adjacent the shoulder an inner bearing portion which is plain and affords a continuous circumferentially extending bearing surface which is level with or slightly proud of the bearing surfaces of the ribs.

The invention will now be more particularly described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a part-sectional side view of a spigot device in a part-assembled condition and a part of a framework member to be engaged with a spigot device which affords two spigots,

Figure 2 is a plan view of the spigot device in Figure 1 but when assembled,

Figure 3 is a cross-sectional view of Figure 2 on the lines 3—3 thereof and on an enlarged scale,

Figure 4 is a cross-sectional view of the framework member shown in Figure 1 on the lines 4—4 thereof and on an enlarged scale,

Figure 5 is a part-sectional side view of a further form of spigot device,

Figure 6 is a plan view of Figure 5,

Figure 7 is a sectional view of Figure 5 on the lines 7—7 thereof,

Figure 8 is a fragmentary sectional view on a considerably enlarged scale of a detail,

Figure 9 is a side view of a further form of spigot device,

Figure 10 is a sectional view of Figure 9 on the lines 10—10 thereof,

Figures 11 to 16 are perspective views showing spigot devices with three, three, four, four, five and six spigots respectively,

Figure 17 is a part-sectional view of a still further form of spigot device, and

Figure 18 is a sectional view of Figure 17 on the lines 18—18 thereof.

For convenience similar reference numerals will be used to denote corresponding parts throughout the several views.

Referring to Figures 1 to 4 the spigot device 10 comprises a substantially cubic body 12 from which extends two spigots 14 disposed at right-angles to each other and each of the spigots is arranged to have an interference fit engagement with a socket 16 provided in a framework member 18.

The framework member 18 is made of metal tube of any suitable length and is of substantially square cross-sectional shape as shown in Figure 4 with, however, rounded corners and the socket 16 is therefore of substantially square cross-sectional shape and includes four internal sides 20.

The spigot device comprises a rigid tubular metal core 22 which includes a central body part 24 from which extends two spigot parts 26 disposed at right-angles to each other. Conveniently the rigid metal core is formed of two lengths of metal tube of square cross-sectional shape with, however, rounded corners as clearly shown in Figure 3 and the end of a horizontal spigot part, as viewed in Figure 1, abuts a side vertical spigot and the two are welded together as indicated at 28 to form the core.

The upper end of the vertical tube, as seen in Figure 1, is closed by a metal sealing plate 30 welded to the upper end of the vertical tube and forming a portion of the body part 24, said plate 30 being provided to avoid synthetic plastics material, hereinafter referred to, entering the body part of the core during manufacture of the spigot device.

Thus the metal core 22 is rigid and fabricated from a number of parts which, however, are welded together to form a rigid one-piece core.

Completely covering the exterior of the metal core 22 is a case generally indicated at 32 and made of a suitable synthetic plastics material which is preferably a synthetic thermo-plastic material such as, for example, nylon, but it should be appreciated that other synthetic plastics materials having similar properties to nylon could be used including suitable thermo-setting plastics materials.

The case 32, which is preferably a thermo-plastics material, is applied to the metal core, after of course the core has been fabricated, by placing the core in an injection moulding machine and then moulding onto the body part 24 of the core a cubic case part 34 and simultaneously on the inner end of each spigot part 26 an inner bearing portion 36 from which extends outwardly a small projection 38, and the core and case part 34, inner bearing portions 36 and projections 38 are removed as a one-piece part from the injection moulding machine.

Each inner bearing portion 36 has plain surfaces and rounded corners so as to afford a continuous circumferentially extending bearing surface and is generally of square cross-sectional shape and is of such transverse dimensions as to have an interference fit engagement with the socket 16 of the framework member 18. Conveniently the external width of the inner bearing portion 36 is 0.017 inches larger than the internal width of the socket 16 when the internal width of the socket is 0.888 inches so that the inner bearing portion can effect a drive-fit engagement with the socket 16.

To cover the core spigot parts 26 there are formed a number of hollow spigot case parts 40 which are moulded so as to be of cup-shaped formation having four sides which define a generally square cross-sectional shape and an outer end wall 52 which closes one end of said spigot case part.

When each spigot case 40 is made by injection moulding and is of a synthetic thermo-plastics material such as nylon or any other similar material the cross-sectional dimensions of the bore 42 are such as to enable said spigot case part, whilst still hot from the injection moulding machine in which it is made, to be passed onto a core spigot part 26 so as, when cooled, to exercise a shrink-fit retentive engagement with the core spigot part 26 to secure said case part to the core.

The inner end edge 44 of the spigot case part abuts an outer end edge 46 of the inner bearing portion 36 and to ensure that the metal core is not exposed between the inner bearing portion 36 and the inner end of the case part 40, the bore of the inner end of said case part is formed with a recess 48 which receives the projection 38. When the case part 40 is secured in position on the core spigot part 26 the outer end 50 of said core spigot part abuts the inner face of the end wall 52 of the case part 40. Thus the rigid metal core 22 has secured thereto a case 32 made of a synthetic thermo-plastics material and completely covering the exterior of the metal core.

The exterior of the spigot case part 40 is of generally square cross-sectional shape corresponding to the cross-sectional shape of the socket 16 in a framework member 18 and the external overall width of said spigot case part 40, including ribs 54 hereinafter more specifically described, is slightly less in width than the width of the inner bearing portion 36, for example the external overall width

of the case part 40 is approximately 0.015 inches less than the external width of the inner bearing portion 36 so that the latter stands slightly proud of the case part 40 which, however, is of such dimensions as to have a lesser interference-fit engagement with the socket 16 than the inner bearing portion 36. Formed on the exterior of the spigot case part 40 and thus on the spigot 14 are the ribs 54, there being three ribs on each of the four sides of the spigot case part 40 and thus of the spigot 14 and each rib extends longitudinally of the spigot so that a longitudinal central axis of each rib 54 is parallel with a longitudinal axis A—A of the appropriate spigot and each rib extends for the full length of each case part 40 and thus for at least the major part of the length of the spigot 14 and affords an external flat or substantially flat bearing surface 56 to engage the socket 16.

On each side of the spigot there is a central rib 58 and two ribs 60 disposed at equal distances from a longitudinal central axis of the central rib 58 on opposite sides thereof so that the longitudinal axes of the ribs are parallel with the longitudinal axis A—A of the spigot.

As illustrated in Figures 1 and 2 each rib 54 is divergent longitudinally from the outer end wall 52 of the case part 40 of the spigot towards the inner bearing portion 36 of the spigot and also as shown in Figure 3 each rib is divergent transversely inwardly and the divergence of the ribs both longitudinally and transversely inwardly or radially is symmetrical about longitudinal and transverse central axes through the ribs.

The width of the outer end of the spigot of each of the ribs 54 is less than the width of each of the two grooves 62 therebetween on a side of the spigot whilst adjacent the inner end of the spigot the width of each of the ribs is greater than the width of each groove between ribs on said side of the spigot. Thus, the total width of the ribs at the outer end of the or each spigot is less than the total width of the grooves therebetween, and the total width of the ribs adjacent the inner end of the or each spigot is greater than the total width of the grooves therebetween.

The ribs 54 are inclined at 64 at their outer ends relatively to the longitudinal axis A—A of the spigot to provide a divergent "lead" to facilitate entry of the spigot 14 into the socket 16.

As will be seen from the drawings, the two outer ribs 54 adjacent a corner of the spigot are relatively close together and afford a groove 66 therebetween which is narrower than the grooves 62 so that said two relatively closely positioned outer ribs 54 afford a strong corner whilst also providing the groove 66 which affords clearance with respect to the concave corners of the socket 16.

As shown in the drawings, the body 34 is larger than each inner bearing portion 36 so as to form abutment shoulders 68 against which an end edge 70 of a framework member 18 can abut when engaged with spigot 14.

By forming the ribs 54 longitudinally and for the major part of the length of the spigot 14, a relatively easy initial interference but put-fit engagement of the spigot with a socket is allowed followed by a final interference but drive-fit engagement of the socket with the inner bearing portion 36 of the spigot and the complete, i.e. not grooved, corners 72 of said inner bearing portion afford effective corner engagements with the concave corners of the socket to help resist relative rotation of the spigot 14 and socket 16 during and after engagement thereof.

It will be appreciated that the ribs 54 and the inner bearing portion 36 are both composed entirely of a synthetic plastics material which is slightly flexible and therefore is capable of a small amount of distortion such as will permit an interference-fit to be obtained between the spigot and the socket of a framework member.

Instead of the spigots being substantially square for engagement with a substantially square socket of a framework member, the spigots may be of any other convenient cross-sectional shape to engage sockets of a corresponding convenient cross-sectional shape in a framework member.

The invention thus provides a spigot device comprising a body and one or more spigots extending therefrom and the or each spigot is rigid with the body so as not to be detachable therefrom.

Referring now to Figures 5 to 8, these disclose a spigot device which is basically similar to the spigot device described in Figures 1 to 3 but with the difference that the plain inner bearing portion 36 is provided at the inner end of the cup-shaped case part 40 and the inner end edge 44 of said case part abuts the abutment edge 68 of the case body part 34 and against which edge 68 the end edge 70 of the framework member 18 abuts when said framework member is engaged with a spigot 14. The grooves 66 are shorter than the grooves 62 so that complete, and thus strong, corners are provided inwardly of said grooves 66.

To ensure that there is no gap between the inner end of the spigot case part 40 and the abutment edge 68 a continuous thin boundary flange 74 is formed at the inner end of said spigot case part and this boundary flange is deformed and collapsed when the spigot case part is pushed onto the spigot core part 26 so that the inner end of the spigot case part 40 abuts the cubic case part 34.

Referring now to Figures 9 and 10, these disclose a still further form of spigot device in which each spigot 14 has a plain inner bearing portion 36 formed at the inner end of the spigot and includes longitudinally extending ribs 54 of which the sides are parallel as shown in the drawings. A central rib is provided on each of the four sides of each spigot 14 and also two edge ribs are formed on two opposite sides of each spigot as clearly shown in Figure 10.

The entire case 32, made of a synthetic plastics material and covering the central body part 24 and the spigot parts 26 of the core 22, is moulded in a single injection moulding operation and the outer end of each spigot 14 is open at 75 as shown in Figure 10 but the outer end of the metal spigot core part 26 is covered by an in-turned lip 76.

Whilst the spigot device illustrated in the drawings has two spigots disposed at right-angles to each other it should be understood that a spigot device may be provided having a single spigot only and various other forms of spigot devices may be provided. For example, as shown in Figure 11 the spigot device is T-shaped so that the three spigots are disposed with their longitudinal axes in a single plane and a central spigot is disposed at 90° to each of the other two aligned spigots; as shown in Figure 12 the spigot device has three spigots disposed mutually at right-angles to each other so that the longitudinal axes of any two spigots are in a common plane; as shown in Figure 13 the spigot device has four spigots disposed with their longitudinal axes in a common plane and adjacent spigots are disposed at right-angles to each other; as shown in Figure 14 a spigot device has four spigots in which three of the spigots define a T-shape as mentioned above and the fourth spigot is disposed with its axis in a plane at right-angles to the plane containing the longitudinal axes of the previously mentioned three spigots; as shown in Figure 15 the spigot device has five spigots in which four of the spigots have their longitudinal axes disposed with its longitudinal axis at right-angles to each other and the fifth spigot is disposed with its longitudinal axis as right-angles to the plane containing the longitudinal axes of the said four spigots; as shown in Figure 16 the spigot device has six spigots which is as the five spigot device shown in Figure 15 and to which is added a sixth spigot which is aligned with the said fifth spigot.

Referring to Figures 17 and 18 these disclose a still further form of spigot device which is basically similar to the spigot device described with reference to Figures 1 to 3 with, however, the following differences which are rendered desirable solely in order to facilitate manufacture of the device. The core spigot parts 26 are covered by hollow spigot case parts 40 each of which are mounted in the form of a sleeve open at its opposite ends and when applied to a core spigot part 26 so as to have a shrink-fit retentive engagement therewith. The outer end 50 of the core spigot part is flush with an outer end 80 of the spigot case part 40.

To close the outer end of the spigot 14 there is provided a plug 82 made for example by injection moulding and of a synthetic thermo-plastic material such as nylon or any other suitable material. The plug comprises a shank 84 of substantially square cross-sectional shape and of a size such as to have an interference drive-fit engagement with the interior of the core spigot part 26. The plug 82 also comprises a head 86 having a planar inner face 88 which abuts the outer ends 50 and 80 of the core and case part 26 and 40 respectively so that only a joint line 90 is visible. The outer end face 92 of the head 86 is planar or substantially planar and may carry a motif.

The head 86 has four sides defining a generally square cross-sectional shape and including three ribs 94 on each of said four sides and said ribs are aligned longitudinally and correspond in formation to the ribs 54 and are inclined at 96 to merge with the inclined ends 64 of said ribs 54 so that exteriorly the head 86 and case part 40 merge with each other.

It should be appreciated that in all spigot devices the or each spigot extends from a body 12 and each spigot device has a one-piece tubular metal core which is preferably formed from a plurality of metal tubular parts secured together such as by welding as previously described or each metal core may be made in one piece such as a metal casting or moulding and each core includes a spigot part 26 which extends for substantially the full length of each spigot which is rigid with the body.

The invention thus provides an improved spigot device which facilitates quick and easy assembly of rigid frameworks and of which devices the spigots can effect a relatively easy initial insertion into a socket of a framework member followed by a final tighter and secure engagement with the framework member.

WHAT WE CLAIM IS:—

1. A spigot device to engage a socket of a framework member and comprising a body, a spigot extending therefrom and rigid therewith, the body being of larger overall external cross-sectional dimensions than the spigot to afford a shoulder therebetween against which can abut an end of a socket of the framework member when mounted on the spigot and the spigot having a plurality of external ribs extending longitudinally

thereof for the major part of the length of the spigot to afford bearing surfaces to engage the socket and said spigot also having adjacent the shoulder an inner bearing portion which is plain and affords a continuous circumferentially extending bearing surface which is level with or slightly proud of the bearing surfaces of the ribs.

2. A spigot device to engage a plurality of sockets of framework members and comprising a body and a plurality of spigots extending therefrom and rigid therewith, the body being of larger overall external cross-sectional dimensions than the spigots to afford shoulders between the body and the respective spigots against which can abut ends of sockets of the framework members when mounted on the spigots and each spigot having a plurality of external ribs extending longitudinally thereof for the major part of the length of the spigot to afford bearing surfaces to engage the appropriate socket and each spigot also having adjacent the shoulder an inner bearing portion which is plain and affords a continuous circumferentially extending bearing surface which is level with or slightly proud of the bearing surfaces of the ribs.

3. A spigot device according to Claim 1 or 2 wherein the ribs of the or each spigot are disposed with their longitudinal central axes parallel with a longitudinal axis of said spigot.

4. A spigot device according to Claim 3 wherein each rib is divergent longitudinally from an outer end of the or each spigot.

5. A spigot device according to Claim 4 wherein each rib is divergent transversely inwardly.

6. A spigot device according to Claim 3 wherein the sides of each rib are parallel with the axis of said spigot.

7. A spigot device according to any of the preceding claims wherein the total width of the ribs at the outer end of the or each spigot is less than the total width of the grooves therebetween.

8. A spigot device according to Claim 7 and either Claim 4 or 5 wherein the total width of the ribs adjacent the inner end of the or each spigot is greater than the total width of the grooves therebetween.

9. A spigot device according to any of the preceding claims wherein the or each spigot is of substantially square cross-sectional shape.

10. A spigot device according to Claim 9 wherein each side of the or each spigot is provided with a central rib and two ribs disposed equally on opposite sides of the central rib.

11. A spigot device according to Claim 9 wherein each side of the or each spigot is provided with a central rib and two opposite sides only are also provided with two ribs disposed equally on opposite sides of the central rib.

12. A spigot device according to any of the preceding claims wherein the ribs are inclined at their outer ends to provide a divergent "lead" to facilitate entry of the spigot into a socket.

13. A spigot device according to any of the preceding claims comprising a rigid metal core and a case secured thereto which completely covers the exterior of the core and is made of a synthetic plastics material, said core being disposed in the body and extending therefrom to substantially the outer end of the or each spigot.

14. A spigot device according to Claim 13 wherein the synthetic plastics material is synthetic thermoplastics material.

15. A spigot device according to Claim 13 or 14 wherein the ribs are provided entirely by the case and thus are formed completely of synthetic plastics material.

16. A spigot device according to Claim 14 or 15 wherein the synthetic thermoplastics material is nylon.

17. A spigot device according to any of Claims 13 to 16 wherein the case comprises a case part moulded onto the body core part, an open ended sleeve applied to a spigot core part and a plug secured in said spigot core part and having a head which affords an outer end of the spigot.

18. A spigot device constructed and arranged substantially as described with reference to and as shown in Figures 1 to 3 of the accompanying drawings or as modified so as to have one, three, four, five or six spigots.

19. A spigot device constructed and arranged substantially as described with reference to and as shown in Figures 5, 6, 7 and 8 of the accompanying drawings or as modified so as to have one, three, four, five or six spigots.

20. A spigot device constructed and arranged substantially as described with reference to and as shown in Figures 9 and 10 of the accompanying drawings or as modified so as to have one, three, four, five or six spigots.

21. A spigaot device constructed and arranged substantially as described with reference to and as shown in Figures 17 and 18 of the accompanying drawings or as modified so as to have one, three, four, five or six spigots.

22. A framework comprising one or more spigot devices according to any of Claims 2 to 20 engaged with sockets afforded by a plurality of framework members.

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